 25X1

CONFIDENTIAL

~~SECRET~~

6 August 1956

MEMORANDUM FOR: THE RECORD

SUBJECT : RCA "Micro-Miniature" Transmitter-Receiver Model UMTR-1

1. On 1 August 1956 I visited the RCA plant at Camden to discuss the above equipment. The following persons participated:

I. R. Saddler	RCA (Gov't Contracts)
H. J. Laiming	RCA (Engineering)
W. B. Harris	RCA (Engineering)
* Willard Meeker	RCA (Engineering)
[redacted]	APD

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* A specialist on electro-acoustic transducers, present only while discussing microphones, earphones, and speakers

2. The attached flyer describes the prototype equipment. The present status of the program is as follows. RCA plans to construct 100 sets as soon as possible, and to sell them to interested customers, commercial or militaty. Design changes over the prototype include the use of a single-package battery pack, deletion of the microswitch-type push-to-talk switch and substitution of a cheaper and more reliable slide switch which has no return spring and may be locked either on transmit or receive, and incorporation of a larger and more efficient microphone-speaker which results in a protrusion from the panel about 2" in diameter and ½" in height. It is planned to increase the receiver audio output from the present level of about 1 milliwatt. The battery life is 10 hours when transmitting, and about twice that when receiving. Coils in the 100-lot will permit tuning over the range 48 to 51 mc/s, but it is planned to supply all sets with crystals for 51.0 mc/s. The intermediate frequency is 4.3 mc/s and the quartz crystal is 4.3 mc/s below the operating frequency. The transmitting oscillator tube is modulated (in frequency) by applying audio to a ferrite-cored inductor, and stabilized as to center frequency by an AFC circuit through the receiver. The transmitting power output is about 70 milliwatts. The frequency stability (.02%) and deviation (15 kc/s) meet the usual standards for vehicular FM sets. An excellent base or vehicular station for use in a net is the AN/PRC-10A, which may be operated from internal batteries or from a vehicular supply (AM-598/PRC ?).

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3. Note that the selected frequency of 51 mc/s lies (a) in a band assigned to radio amateurs in the US and possessions and (b) only 3 mc/s below the edge of television channel 2.

4. Without getting down to specific operational situations, I attempted to describe the conditions under which we might use this apparatus, the kind of flexibility needed. The discussion centered on the following points:

a. Frequency Range

With production transistors, which RCA intends to use, the top frequency is limited to 52 mc/s. Lower frequencies, down to 25 or 30 mc/s, can be supplied at extra cost.

b. Antenna

If the antenna is changed there will be two problems: (1) Matching to obtain maximum power output from the transmitter, and (2) arranging matters so that disturbing the antenna will not pull the transmitter frequency beyond control of the stabilizing circuit. If the antenna is body mounted losses will be encountered. An insertion earphone cord has been found moderately successful on a receiver, but has not been tried on a transmitter. I explained that in the 150 mc/s region we had obtained some body antennas more efficient than the usual wire down a coatsleeve, but that in the instant case we would have to leave the antenna choice (for concealed operation) up to RCA.

c. Remote Microphone

With the microphone at a distance from the mouth, say on the lapel, and with the speaker facing away from it, an increase in gain of 10 - 15 db and more emphasis of high frequencies will be required to maintain adequate modulation and normal timbre. With a microphone of the reluctance type as proposed for the 100 lot this can be obtained with one transistor. Tests will have to be made with other and smaller reluctance types, e.g. the Shure models, to determine if the level will be sufficient. The carbon microphone looks inferior from all aspects, especially that of power consumption.

d. Remote Earphone or Loudspeaker

The equipment works satisfactorily with an insertion earphone, and the production sets may be satisfactory at a distance of a few inches with the motor of the insertion unit equipped with a miniature (1" diameter) reentrant horn which is commercially available. Regarding a more readily concealable speaker, RCA exhibited the first model of a horn intended for helmet use. This appears promising, but has not been tested yet. It might be reshaped for hiding in a coat or shirt.

e. Remote Transmit-Receive Switch

Since the antenna connection is transferred by this switch, low capacity and short leads are necessary. So far as is known no relay will fit the space available. I pointed out that some remote switching arrangement is a necessity, otherwise some good concealment locations will be unusuable. A Bowden wire or camera release, while far from ideal, would be better than nothing.

5. RCA will submit a proposal to supply us with 12 sets. As regards frequency these will be in 3 groups of 4 each. Half the sets will be standard models intended for unconcealed applications, and the other half special types for concealed use on the person. As regards microphones and antennas they will survey the situation and use their best judgment. Speakers will consist of insertion units with the reentrant horns and the helmet-type horn will be reserved for consideration later after they have more test information. Switching relays will be investigated, and if there is none suitable the switch action will be remoted mechanically. A quantity of 100 batteries will be furnished.

6. RCA needs frequency assignments as soon as possible in order to change their crystal contract. In addition any applicable information relating to antennas, microphones, earphones, or loudspeakers which we have available should be passed to them for consideration.

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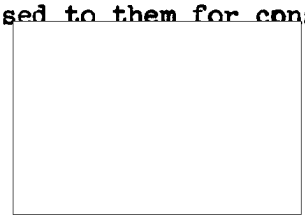


Distribution:
Orig. - Sub File
1 - Chrono

WLS/ls

TYPICAL APPLICATIONS

- For tactical communications between squad and platoon leaders and higher.
- In conjunction with RCA ultra-miniature receiver—for tactical communications with individual soldier or marine.
- Military police and sentry duty.
- Air and sea rescue (survival kits).
- Guided-missile installations (before and after take-off).
- Communications between Maintenance crews, fire crews, and between crews and control tower.
- Medical work (litter-bearers to field hospital).

PERFORMANCE CHARACTERISTICS

GENERAL

Frequency Range	45-50 mc
Frequency Control	Crystal
Communication Range	One-quarter mile
No. of Transistors	12
No. of Tubes	1
Overall Dimensions	5½" x 3" x 1"
Weight	15 ounces (approx.)
Battery Life	10 hours

RECEIVER SECTION

Sensitivity	10 microvolts for 10 db S/N
Selectivity	75 kc at 6 db 400 kc at 60 db
Image Rejection	40 db
A-F Output	5 milliwatts (max.)
A-F Distortion	2.5% at 1 milliwatt
A-F Response	3.5 db, 400-5000 cycles
No. of Transistors	10
Battery Drain	250 milliwatts

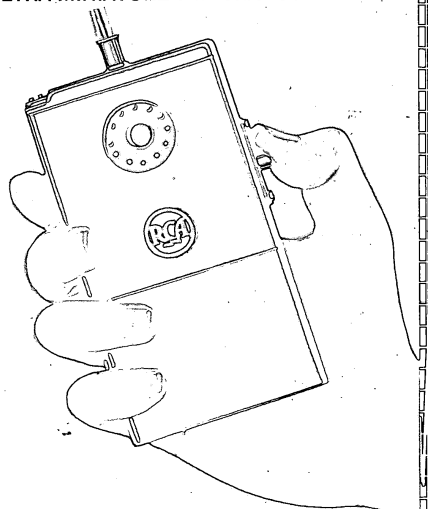
TRANSMITTER SECTION

R-F Power Output	75 milliwatts
Frequency Deviation	15 kc
A-F Response	1 db, 150-3500 cycles
A-F Distortion	6%
No. of Transistors	2
No. of Tubes	1
Battery Drain	575 milliwatts

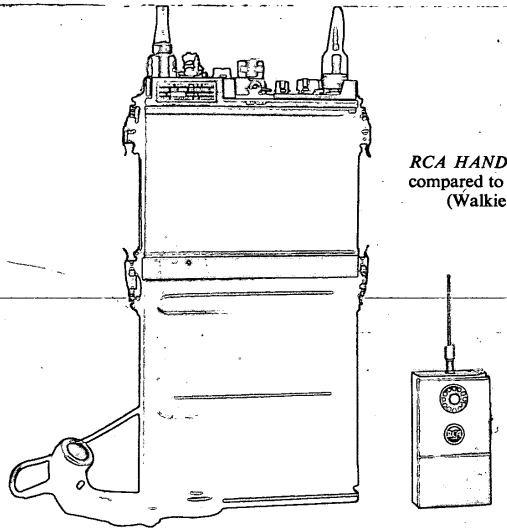
GOVERNMENT DEPARTMENT
ENGINEERING PRODUCTS DIVISION
RADIO CORPORATION OF AMERICA
Camden, N. J., U. S. A.

RCA HANDIE-TALKIE

45-50 MC
ULTRA-MINIATURE F M TRANSCEIVER



RADIO CORPORATION OF AMERICA
JULY 1954



RCA HANDIE-TALKIE
compared to AN/PRC-10
(Walkie-Talkie)

RCA HANDIE-TALKIE

ULTRA-MINATURE TRANSCEIVER

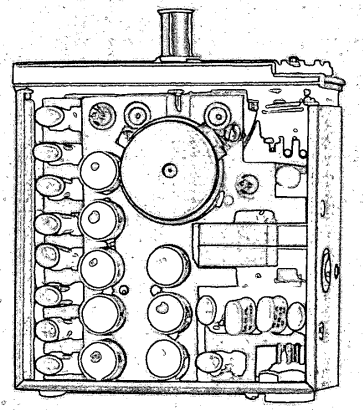
The RCA *HANDIE-TALKIE* is a unique, compact, ultra-miniature narrow-band FM Transceiver. Complete with its battery and all other accessories, it weighs only approximately 15 ounces, and since it is about the size of an average pocket-tin of tobacco, it can readily fit into the palm of the user's hand . . . The RCA HANDIE-TALKIE can be preset for any frequency between 45 and 50 mcs, and it has a range of approximately one-quarter mile . . . Ultra-miniaturization was the guiding factor in designing this equipment—it is not an adaptation of transistors to conventional circuitry, but an entire new and unique design resulting in minimum size, high stability, dependable performance and long battery life. It is ruggedly constructed and completely self-contained—*the receiver-transmitter, microphone-earphone, collapsible antenna, and battery are in one compact assembly*—there are no dangling or extra-weight cords and accessories. The receiver is an all-transistorized superheterodyne, and the transmitter is comprised of two transistors and one tube.

Simplicity of Operation

Only two controls are employed in the RCA HANDIE-TALKIE—a push-to-talk switch and a combination ON-OFF switch and volume control; no tuning or other adjustments are necessary during normal use. For reception, the microphone-earphone provides sufficient volume when held several inches from the ear. The battery is attached to the lower portion of the case; it may be replaced quickly and easily.

FEATURES

- High-performance receiver combined with high-stability transmitter.
- Lightweight—only 15 ounces complete.
- Small—approximately size of pocket-tin of tobacco.
- Compact—all components in one compact assembly; no dangling wires or accessories.
- Dependable—operates whenever needed; ten hours continuous service on one battery.
- Rugged—ideal for field use.
- Corrosion Resistant—constructed of corrosion-resistant materials.
- Transistorized—battery-saving new circuits specially devised for transistors.



RCA HANDIE-TALKIE
with cover removed

OPTIONAL FEATURES

- 2-channel operation (slight increase in size and weight).
- Uni-directional microphone; also detachable microphone.
- May be modified in design to fit special applications:
  Smaller or larger battery . . . Frequencies outside of specified range . . .
  Special design antennas . . . Special carrying or fastening provisions.

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TYPICAL APPLICATIONS

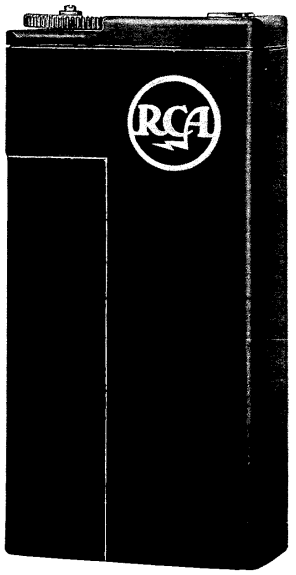
- ▲ Tactical voice communications between individual combat-man and squad, platoon, or high-level leader.
- ▲ Voice communications or alarm operation:
  - *Guided missile launching sites.*
  - *Carrier flight decks.*
  - *Pilot alerting—emergencies during off-duty hours.*
  - *Air raids—military and civil defense.*
  - *Hospitals (permanent and field) and litter-bearers on battlefield.*
  - *Communications between maintenance crews, fire crews, and between these crews and control tower.*

PERFORMANCE CHARACTERISTICS

Frequency Range	*47-55 Mc (crystal-controlled).*
Sensitivity (at 51 mc)	*5 microvolts at 10 db S/N.*
A-F Output	*5 milliwatts (max.).*
A-F Distortion	*1% at 1 milliwatt.*
A-F Response	*3.5 db, 400-5000 cycles.*
I.F. 4.3 Mc	*6 db—75 kc., 60 db—400 kc.*
Battery Drain	*120 milliwatts total.*
Battery Life	*50 hours (approximately).*
Gain	
Conversion	*Approximately unity.*
I.F.	*10 db/stage.*
Image Rejection	*35 db.*
Range	*½ to 1 mile (with AN/PRC-10).*
Number of Transistors	*9.*
Weight	*9 oz. including battery and earphone.*
Dimensions	*4¼" h x 2⅛" w x 1" d (9 cu. inches).*

DEFENSE ELECTRONIC PRODUCTS
RADIO CORPORATION OF AMERICA
CAMDEN, N.J., U.S.A.

RCA ULTRA-MINIATURE RADIO RECEIVER 47-55 MC



RADIO CORPORATION OF AMERICA

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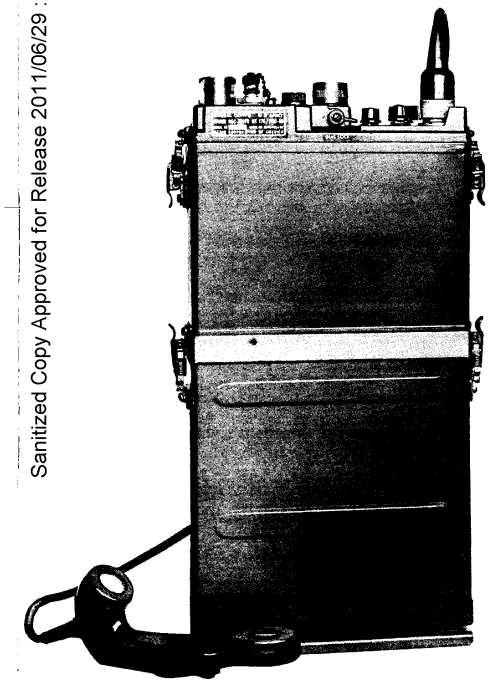
RCA ULTRA-MINIATURE FM RADIO RECEIVER

The *RCA ULTRA-MINIATURE FM RADIO RECEIVER* is a small pocket-size, high-performance f-m receiver designed for reception of tactical voice information between individual combat-man and squad, platoon, or higher-level leaders. It may be pre-set to any frequency between 47 and 55 megacycles, and when used with an AN/PRC-10 (Walkie-Talkie) its reception is clearly intelligible at a distance of one-half to one mile.

The *RCA ULTRA-MINIATURE FM RADIO RECEIVER* is unusually compact and lightweight—it measures only 4¼″h x 2⅛″w x 1″d and weighs only 9 ounces, including battery and earphone... Ruggedness and reliability were prime factors in its design—its transistors, other components, and printed wiring were subjected to the latest techniques of reliability analysis and component evaluation.

The *RCA ULTRA-MINIATURE FM RADIO RECEIVER* is simple to operate, using only one control, and its case and general mechanical construction make it ideal for field use.

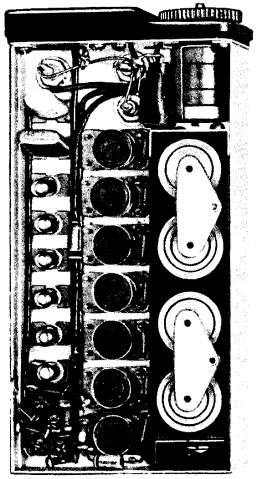


RCA ULTRA-MINIATURE FM RADIO RECEIVER compared to king-size package of cigarettes.

RCA ULTRA-MINIATURE FM RADIO RECEIVER compared to AN/PRC-10 (Walkie-Talkie).

FEATURES

Pocket size—*approximately size of package of king-size cigarettes.*
High sensitivity—*clearly intelligible at ½ to 1 mile (with AN/PRC-10).*
All transistorized—*circuits specially designed for transistors.*
Long-battery life—*miniature long-life batteries.*
Compact—*all components in one compact assembly (9 cubic inches).*
Simple to operate—*only one control.*
Lightweight—*only nine ounces.*
Rugged—*ideal for field use.*
Corrosion Resistant—*all materials corrosion-resistant.*
Reliable—*components subjected to reliability analysis and evaluation.*



RCA ULTRA-MINIATURE FM RADIO RECEIVER with cover removed.

OPTIONAL FEATURES

2-channel operation (slight increase in size and weight).

May be modified in design to fit special applications:

Smaller or larger battery.
Frequencies outside of specified range.
Special design antennas.
Special carrying or fastening provisions.

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Ultra-Miniaturized

FM Military Type Receiver

For the past several years RCA has been conducting an extensive independent research program relating to the application of transistors to electronic equipment, with considerable emphasis on communications equipment. One of the most significant results of this program has been the development of a revolutionary ultra-miniaturized FM military type receiver. This small pocket-size device is designed to receive FM voice signals from the AN/PRC-10 Walkie Talkie . . . The compactness of this receiver offers a new concept in tactical communications by extending service to the squad level or below, without adding excessive equipment burden to the individual. The circuitry involved is new and original, requiring special techniques in the fabrication of related parts. This ultra-miniaturized device is in no sense an adaptation of transistors to conventional circuitry but an entirely new and unique equipment resulting in extremely long battery life and rugged construction.

Performance Characteristics

47-55 MC Transistorized
F.M. Radio Receiver (Crystal Controlled)

SENSITIVITY AT 51 MC	10 Microvolts (Approx.)
AUDIO OUTPUT	5 Milliwatts
I.F. 4.3 MC	6 DB— 75 KC 60 DB—400 KC
BATTERY DRAIN	225 Milliwatts Total Battery shown with model good for 10 hours operation.
GAIN	Conversion—Approx. Unity I.F.—10 DB/Stage
IMAGE REJECTION	40 DB
RANGE	¼ to ½ mile (with AN/PRC-10)
NUMBER OF TRANSISTORS	10
WEIGHT	9 oz. including battery and earphone

NOTE
Above results were obtained with RCA Experimental Transistors. Appreciable improvement in above characteristics are anticipated with latest progress in transistor development.

Government Division
Engineering Products Department

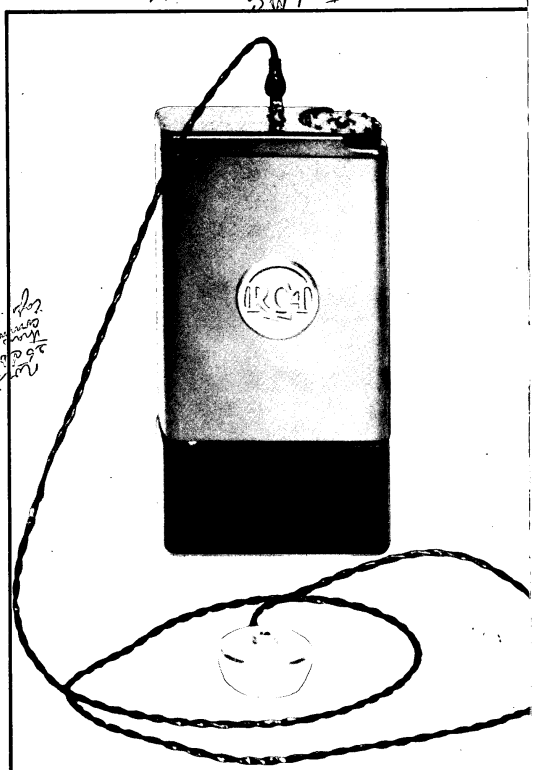
RCA VICTOR DIVISION
Camden 2, New Jersey, U.S.A.

ULTRA-MINIATURIZED FM MILITARY TYPE RECEIVER

47-55 MC

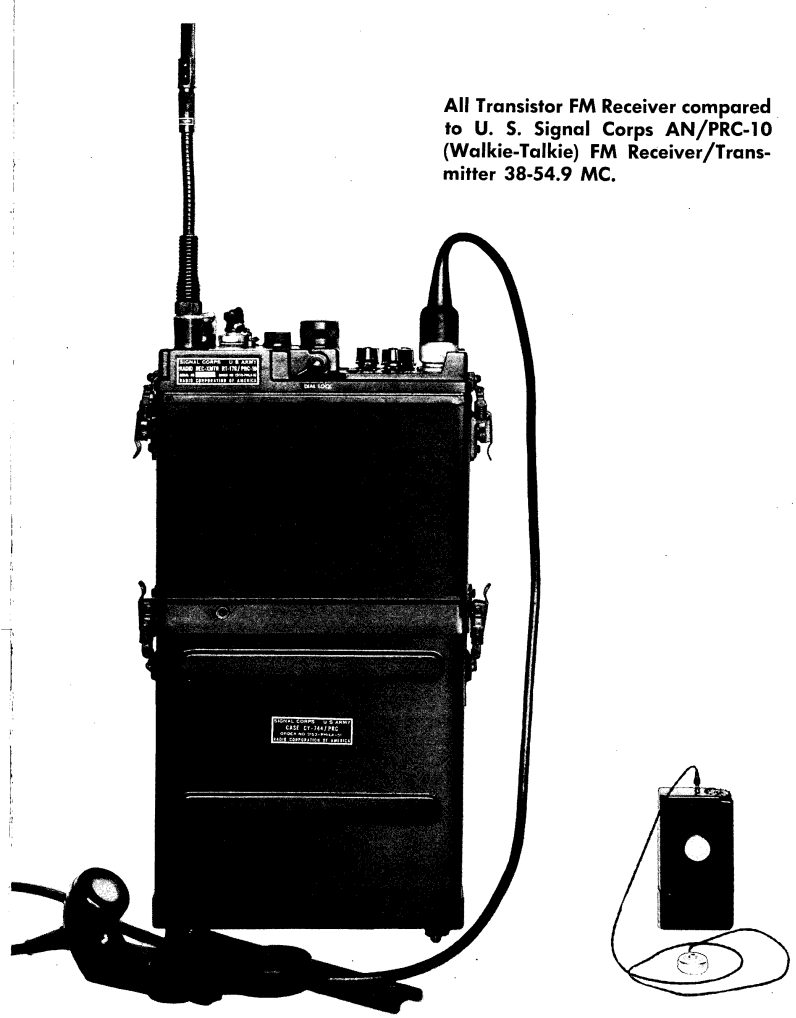
ALL TRANSISTOR

FM RADIO RECEIVER

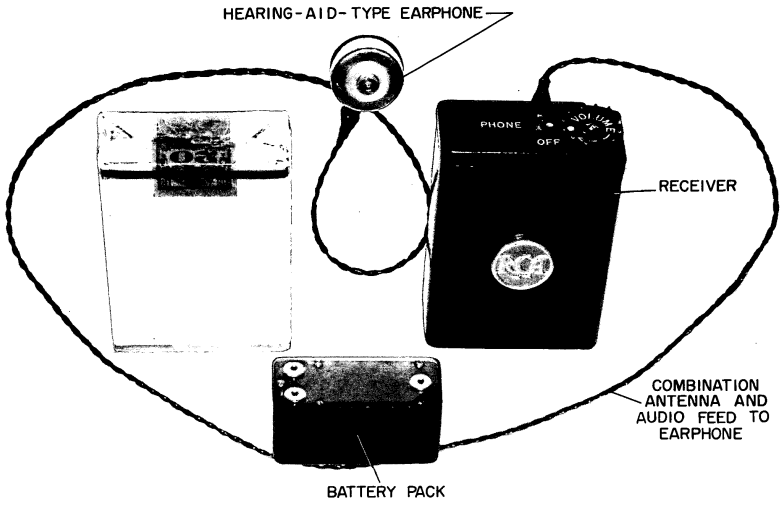


RADIO CORPORATION OF AMERICA

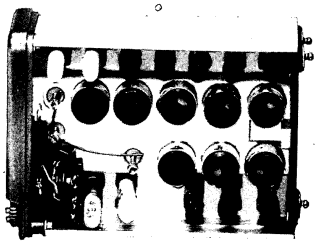
DECEMBER, 1953



All Transistor FM Receiver compared to U. S. Signal Corps AN/PRC-10 (Walkie-Talkie) FM Receiver/Transmitter 38-54.9 MC.



All Transistor FM Receiver (with battery disconnected) compared to standard cigarette package.



All Transistor FM Receiver with case removed.